Implementation of ICT in Kenyan Public Secondary Schools: A Review of Personal Characteristics Influencing Teachers’ Adoption and Integration of the Technology into Teaching

Dr. Laaria Mingaine
School of Management, China
mingainesl@yahoo.com

Abstract

Kenya is in the process of implementing Information Communication Technology (ICT) in schools. The government recognizes the positive effect of ICT in making the country a middle level economy has is envisaged in Kenya vision 2030. The government has disseminated several policies that guide its implementation. However, access and availability of ICT in public schools is still patchy. This has been attributed to several hindrances that have lead to its underutilization. Several studies reveal a number of factors influencing teachers’ decisions to adopt and use ICT into teaching. This article reviews personal characteristics that encourage teachers’ integrate ICT into teaching and learning process. Gender, age, level of education, teaching experience, teacher workload, attitudes towards computer and ICT competence has been identified as factors influencing teachers’ adoption and integration of the technology into teaching. These factors are interrelated. The successful implementation of ICT is not dependent on the absence or availability of personal characteristics, but is determined through dynamics process involving a set of interrelated factors. The article concluded that identifying and knowing the extent to which these characteristics affects teachers’ during implementation of ICT may help in taking a decision on how to tackle them.

Key words: ICT, schools, Kenya, personal characteristics, teachers

1. Introduction

Schools worldwide are under increasing pressure to implement ICT in order to prepare students with skills and knowledge needed for emerging knowledge society. As early as 1980s a considerable educational research and initiatives have been directed towards ICT implementation in schools (Jimoyiannis & Komis, 2007). Different methods have been applied. Important among them being first, developing school technology infrastructure, secondly, developing skills to teachers and other professionals and then producing and integrating ICT-based tools for teaching and learning.

According to research worldwide, implementation of ICT in schools should lead to significant pedagogical and educational outcomes that benefits both teachers and students. A considerable amount of research has shown that implementation of ICT in schools can enhance students’ understanding, motivation, promote active collaboration and lifelong learning, offer better access to information and shared working resources (Laaria, 2013, Andoh, 2012, Jimoyiannis & Komis, 2007). In other words, implementation of ICT in schools appears to change the methods of teaching and learning traditionally practiced in schools. Due to the emerging new technologies teaching could evolve from emphasis on teacher centered to student centered method which can result in a more interactive learning environment in schools. This has benefits of enhancing students’ performance.

ICTs have immense potential for effective teaching and learning, knowledge diffusion, and the development of more efficient school services. Furthermore, the implementation of ICT to schools has been seen as influential way to contribute to school change, improving learning outcomes, enhanced preparation of students for the information age, improving competencies of learners, and providing...
students with survival skills for the information society (Wong, & Li, 2008). Consequently, teachers should actively adopt and integrate ICT into their teaching and learning processes.

2. Kenya National ICT policy on Education

The government disseminated ICT policy during the year 2006, with a vision; “A prosperous ICT-driven Kenya society.” The section on technology sets out the strategies and objectives pertaining to ICT in education. The section highlights that the government would encourage implementation of ICT in schools to improve quality of teaching and learning. The policy states that lack of a clear ICT framework on adoption and use of ICT in schools has hampered its development and utilization. In this regards, the government outlines that it will encourage implementation of ICT in schools through:

a) Promoting the development of e-learning resources;
b) Facilitating Private-Public Partnership to mobilize resources in order to support ICT implementation initiatives;
c) Promoting development of integrated e-learning curriculum to support ICT in schools;
d) Promoting establishment of a national ICT centre of excellence where schools can borrow parallels;
e) Provision of affordable ICT infrastructure to facilitate dissemination of knowledge and skills to schools;
f) Developing e-content to address the educational needs of secondary schools;
g) Creating awareness of the opportunities offered by ICT as an educational tools to schools;
h) Facilitating sharing of ICT facilities between schools;
i) Integrating ICT resources with other existing school resources (Ministry of Information and Communication, 2006),

Kenya has placed considerable emphasis on the importance of ICT in its schools as evidenced in the recent promulgation of the National ICT Strategy for Education and Training and Vision 2030 which placed ICT on the centre of development.

3. Situation of ICT implementation in Kenyan public secondary schools

Use of computers in Kenya can be traced as from early 1980s while internet usages become available in late 1990s (Laaria, 2013). By 2012, about 15.5% of population was accessing internet, mostly by private sector and government employees. Apart from accessing internet from mobile phones, there are over 5000 cybercafés that continue to provide majority of population with internet, however, the access is still limited especially in rural areas (Kipsoi, et al, 2012).

The implementation of ICTs in schools in developing countries remains very limited despite a decade of considerable large investments in the technology. Like other developing countries, Kenya continues to struggle with high levels of poverty that has affected implementation of the technology in schools (Neunge et el, 2012). Initially, the aim to implement ICTs was primarily to develop ICT skills to students, the focus has over time shifted to leverage ICT to address issues of quality and improve teaching and learning in schools. However, access and availability of ICT in public schools is still patchy. Kenya has approximately 7425 secondary schools with approximately 85% being located in rural areas. About 65% of them have electricity, with about 1300 having an average of 10 computers each, though connectivity is limited. Makhonu, (2010) found that some schools had computers but this could be limited to one computer in the office of the school head. The author concluded that very few schools had sufficient ICT tools for teaching and learning. In schools with computers, the study found that the student-computer ratio was high and this was a challenge faced during integration of
technology in teaching. This shows a very slow implementation pace and may lead to all benefits of ICT in schools not realized or un-equitably realized in the near future.

Research suggests that education sector is investing heavily on ICT but the technology adoption and use in education as continued lagging behind other sectors. A study by Manduku et al, (2012) reveal while implementation of ICT has been achieved by many sectors including medical services, banking, communications and transportation, penetrations in schools seems to lag behind. It was found that usage of computers in classroom was still in its early phases. The study concluded that the experiences and perceptions of school leaders and teachers played an important role in the implementation of ICT in Kenyan schools. This meant there was need to provide effective and efficient pre-service and in-service courses that could enable teachers successfully use computers in the course of teaching. A further study by Kipsoi, et al (2012) suggested that the government should revise national plans to implement ICT as while as review both programs for teacher preparation and staff development. In another study by Laaria, (2013) found that school leader’s interest; their commitment and championing implementation of ICT programs in schools positively influenced the whole process. The study recommended incorporation of ICT curriculum and managerial skill to training of head teachers.

4. Hindrances leading to Underutilization of ICT in Kenyan schools

Several studies have assessed reasons for under use of ICT in schools in Kenya (Manduku, et al 2012; Laaria, 2013; Hennessy, 2010). The cost of ICT infrastructure including software and hardware, putting up telecommunications networks, transportation, maintenance and repairs of equipments is often unaffordable by many developing nations. Hennessy (2010) observed that to reduce costs and enhance competition, privatization for acquiring facilities should be an option. Generally, like other African countries, Kenya have poor infrastructure including limited electricity supply, unreliable transportation, poor telecommunication and broadcast facilities (Manduku et al 2012). This complicates implementation of ICT in schools, as many cannot maintain internet connections. In case of electricity, the government does not subsidize making it rather costly at an average cost of US$ 0.175/KWh as compared to countries like China which cost less than US$0.045KWh or South Africa at US$0.055.

Implementation of ICT requires appropriate allocation of government funds, donor support and good governance. However, in many African countries corruption, poor ICT policy or lack of it and poor management of ICT implementation projects has led to duplication of effort, ineffective implementation, waste of technology resources and use of different systems and standards. Many initiatives to implement ICT are often uncoordinated and therefore, results in competition rather than complementing each other. In many instances, schools have computers that are essential for ICT implementation, but they do not work as resources for the maintenance have been redirected or misused (Manduku et al, 2012).

Language barriers, cultural context of ICT implementation, teachers’ skills, adequacy and attitudes affects the way implementation is done in schools. Alleged hindrances in the implementation of ICT in schools are based on belief that its implementation requires extra time, challenging, cost of acquiring and maintenance facilities are unaffordable, and technology skills are hard to learn. For example, as Andoh, (2012) observes many of humanities teachers are more unwilling to use computer in class than science or mathematics teachers as they regard it difficult to understand. Inadequate and limited teachers and students skills in computer knowledge is precipitated by inability or reluctance of schools to implement ICT and this often results in restricted use of its benefits, creating a vicious cycle (Keengwe, & Onchwari, 2011). Jimoyiannis & Komis (2007) found that some teachers viewed use of computer in class resulted in waist of students time needed in preparing for national examinations and it disrupted the traditional norms in classroom.
5. Personal Characteristics influencing teachers’ adoption and integration of ICT

According to Andoh, (2012) personal characteristics such as age, gender, level of education, teaching experience, teacher workload, teacher attitudes towards computers in school and ICT competence can influence the adoption and use of ICT in schools. Makhonu, (2010) observes that teachers are implored to integrate and use ICT into teaching and learning activities, but their preparedness to adopt the technology into teaching determines the effectiveness of the ICT and not by sheer existence of technology in classrooms. Bukaliya & Mubika, (2012) found that teachers’ attitudes towards technology greatly influenced their adoption and use of ICT into teaching. Makhonu & Kamper, (2012) argue that teachers’ anxiety, fear, lack of confidence and competence often implies the technology takes a back seat to conventional learning mechanisms. Therefore, an understanding of personal characteristics that influence teachers’ adoption and use of ICT into teaching is pertinent.

**Gender**

According to Jimoyiannis, & Komis, (2007) the implementation of ICT in schools has produced new social stereotypes and gender inequalities. The authors argue that since innovation of computers, activities related to ICT have been viewed as a male domain. On school level, the author argues that old stereotypic gender differences in achievements and attitudes that existed in science, technological disciplines and mathematics were extrapolated to the area of ICT.

Several studies have revealed that males have a more positive attitude towards ICT than females. Makhonu (2010) states that males are more frequent users of computers than females while Andoh (2010) reveal that female teachers are less experienced in ICT use, tends to be more anxious and less confident on their ICT capabilities and it is less likely that they will implement it in various tasks they perform in schools.

**Age**

In a study conducted by Makhanu (2010) shown that older teachers had fewer ICT skills as compared to young teachers. In another study by Afshari, at el, (2009) revealed that the decision to implement ICT in schools by young teachers was strongly influenced by their attitude towards using the new technology. In contrast, the decision to implement ICT by old teachers was more influenced by subjective norm and perceived behavioral control. The authors concluded that young and old teachers adopted very different decision processes in implementing ICT in schools.

Jimoyiannis, & Komis, (2007) found that young teachers aged 30 years and below are considerably more likely to develop ICT skills at home as they grow up with computers than those above 30 years. The authors concluded that there might be disparity between the ICT skills of older teachers and those skills that are required for implementation of ICT in schools. Afshari et al (2009) argued that teachers who trained 20 years ago were educated by people who themselves were trained before implementation of ICT in schools. Consequently, the old teachers would likely tend to maintain the status quo. However, Andoh (2010) found that age was not a significant factor in relation to teachers’ attitudes towards implementation of ICT in their schools.

**Level of education**

Makhonu, (2010) observed that an individual may master certain skills, such as ability to produce graphs and tables using spreadsheet software. The author notes that since ICT skills are associated with the process of continuous learning, trainees regularly incorporates several methods to learn necessary skill, either informally or formally and seldom rely on only one method of learning. The author further notes that individuals with less than secondary education are significantly less likely to use ICT for a range of purposes. According to Afsheri et al, (2009) scales that measure individuals’ attitudes towards computers and Internet tend to increase with the literacy proficiency of the individual.
While formal training of teachers on adoption and use of ICT at teachers training institutions may be an effective means to prepare them, the rapid nature of technological change and development in the world of ICTs emphasis the need for lifelong learning. Makhonu, (2010) notes that education can be an important means to develop at least basic ICT skills and implementation of ICT in schools may mean that as time goes by, more people are likely to use ICT. According to Menjo & Boit, (2012) people with more education have higher ICT skills, though the authors notes that more educated people tend to work with computers, making it difficult to differentiate whether employment or education has the biggest impact on ICT skill levels. It is believed that the more individual is educated the more he/she is able to adapt faster to the changing life in knowledge society.

Teaching experience

Though Makhonu, (2010) argue that there is no statistically direct relationship between the ICT skills of more experienced teachers and the less experienced ones, most researchers showed that teaching experience influence the successful adoption and use of ICT in classroom (Andoh, 2012; Afsheri et al, 2009; Wong & Li, 2008). Andoh, (2012) found that teachers experience is positively correlated with actual use of ICT in class. Wong & Li, (2008) reports that effective use of ICT was related to computer comfort levels and the liberty to shape instruction to teacher-perceived students needs. Lau & Sim (2008) reported that in Malaysia schools, experienced teachers frequently used computer technology in classroom more than newly employed teachers.

However, Khan, et al, (2012) argue that experienced teachers are less ready to adopt ICT into their teaching. Laaria, (2013) reporting on a study done in United states in 2000, observed that teachers with less experience in teaching were more likely to adopt ICT in their teaching than teachers with more experience. The reason to this disparity may be that fresh teachers are more experienced in using the technology. Nevertheless, Andoh, (2012) reports that there is no relationship between teachers’ teaching experience and experience in the use of ICT implying that teacher’ ICT skills and successful implementation is complex and not a clear predictor of ICT adoption in teaching.

Given emphasis on the ICT on younger generation, there would appear to be a far greater body of research into skills, competencies, attitudes and experiences of Newly Qualified Teachers or those in Initial Teacher Training than longer serving teachers. But as Hennessy (2010) point out, little is known about the influence of teachers who have already established ways of working with ICT. Khan, et al, (2012) observed that there might exists a perception that those newly employed teachers were more experienced with ICT and were more committed to its use than longer-serving teachers. But Wong & Li, (2008) noted that majority of teachers in schools today trained before ICT became a significant development in education. Most of Teachers Training Colleges programs continue to provide trainees with skills and competencies needed to use ICT in school. However, it is wrong to assume that all new teachers would have same levels of confidence in ICT. Therefore, in-service courses should be modified in a way to re-train even newly members in teaching profession.

In-service courses should focus on:

- Skills and applications of ICT
- Integration ICT into existing curricula
- Changes in the curriculum and in ICT use
- Teacher roles in implementation of ICT
- Management of ICT in schools
- Legal and ethical issues of ICT in school
- Educational and learning theories

Ideally, these should be addressed in pre-service teacher training and built on and enhanced by in-service courses. ICT are swiftly evolving technology, therefore, even most skilled ICT teachers need to continuously upgrade their skills and keep abreast on latest developments and best practices. According to Teo, (2008) inability of teachers to understand why they should use ICTs and how
exactly they should use them is a barrier to implementation of ICT in schools. Unfortunately, most teachers’ training colleges are more on teaching about ICT rather than teaching on how to use ICT to teach.

Teacher workload

Several studies reports that teachers workload influence their acceptance of technology in classroom. Manduku et al (2012) after investigating factors related to use of computer in management of schools in Kassess zone of Uasin Gishu County, Kenya reported that increased workload coupled with teaching with technology was critical to the participants of the study. The factors reported to contribute to increased workload were constant course upgrade, maintenance, student emails, and continuous search of sustainable strategies and learning of new skills. Similar study by Papaiaannon & Charalambous, (2011) in Cyprus schools reported that teachers viewed curriculum was already overcrowded and adding more was pushing them to the limit and in some cases beyond. Kipsoi, et al (2012) reports that teachers were already overloaded; they could not cope with the pressure and more so pressure from ICT training. Laaria, (2013) found that teachers are overloaded to learn, at the same time teaching and preparing for teaching and practice what they learn. According to Andoh, (2012) for teachers to realize the aims of educational system as well as implementing new initiatives, it necessary to lessen their workload.

Attitudes towards ICT

Many authors and researchers recognize that teachers’ educational beliefs and attitudes are strong indicators of their instructional decisions, planning and classroom practices. To successfully implement ICT in schools depends strong on the teachers’ attitudes and support. According to Andoh, (2012) if teachers perceive ICT programs as neither fulfilling their needs nor their students’ needs, it is likely that they will not implement the programs into teaching and learning. Makhonu, (2010) noted that among the factors that influenced successful implementation of ICT in school were teachers’ beliefs and attitudes towards technology. If teachers had positive attitudes towards the use of ICT then they can easily provide useful insights about the implementation and use of the technology in teaching and learning processes. Menjo & Boit, (2012) conducted a study on challenges of using ICT in schools in Kenya. The study revealed that though challenges such as lack of software and hardware existed, teachers positive attitudes towards ICT was an important determinant to the successful implementation of technology in schools.

In another study conducted by Teo, (2008) on teachers’ attitudes towards computer use in Singapore revealed that teachers were more positive about their attitudes towards computers and intention to use computer than their perceptions of the usefulness of the computer and their control of the computer. A survey conducted by European Schoolnet in 2010, (cited by Andoh, 2012) on teachers’ use of Acer netbooks revealed that teachers’ use of netbook had positive impact on their learning, helped to lengthen study beyond school day and promoted individualized learning. Lau and Sim, (2008) argued that most of efforts directed in integrating ICT in teaching and learning have often been unsuccessful because of their top-down approach, which failed to take teachers’ existing attitudes, beliefs and knowledge into account before implementation of the technology. It is believed that teachers’ positive attitudes towards ICT are expected to foster ICT integration in teaching and learning. Andoh, (2012) concluded that for successful transformation in schools, user need to develop positive attitudes towards the innovation.

ICT competence

Khan et al, (2012) defines computer competence as being able to handle a wide range of varying computer applications for various purposes. According to Andoh, (2012) teachers’ computer competence is a major forecaster of adoption and use of ICT in teaching. Several studies have established that majority of teachers who reported negative attitudes towards adoption and use of ICT into teaching and learning processes lacked skills and knowledge that would allow them to make
informed decisions (Laaria, 2013; Andoh, 2012, Makhonu, 2010). In a study conducted by Manduku et al, (2012) on the teacher competence and confidence level regarding use of ICT in teaching, it was found that technical competence influenced teachers’ use of ICT in teaching. The study found that new and experienced teachers stressed the need for attitude and technical skill, while innovative teachers emphasized didactic and curricula competences. According to Bukaliya & Mubika (2011) teachers with more experience with computers have greater confidence in their skill to use them successfully. Andoh, (2012) concludes that teacher competence relate directly to confidence.

Research has shown that lack of ICT-related knowledge of teachers was one of the main impediments to realization of their ICT-related goals (Teo, 2008; Hennessy 2010). A lot of literature describes the kind of skills that teachers may need when implementing ICT in schools. However, the kind of competencies each teacher needs to acquire very much depends on specific circumstances of their particular school. Some teachers may be suited for lecturing to large or small groups of students, while others are more confident in coaching or on technical matters.

At school level, teachers themselves needs to become lifelong learners, with traditional teacher training models being replaced by models that allow teachers to learn independently at their own pace and supported by ICT (Teo, 2008). Important support tools would be tools for self-assessment that direct teachers to relevant knowledge sources. There could also be recognition that substantial learning could take place while teaching and even by learning from students.

Another factor with influence on teachers’ adoption and integration of ICT in teaching is computer self-efficacy. According to Luszczynska & Schwarzer, (2005) self-efficacy is individual’s believe and confidence on his own ability. Individual’s self-efficacy can affect the way he/she approaches challenges, tasks or goals. Teachers’ confidence refers both to the teachers’ perceived likelihood of success on using ICT for teaching purposes and on how far the teacher perceives success as being under his/her control. According to Andoh, (2012) teachers’ computer self-efficacy influences their adoption and use of ICT in teaching and learning. The author observes that teachers feel reluctant to use computer if they lack confidence.

Lack of ICT knowledge and fear of failure has been cited as some of the reasons for teachers’ lack of confidence for adopting and using ICT into teaching. Research indicates that some teachers feel their status is threatened because they find themselves in a situation where some students are more skilled and knowledgeable than they are (Ananiadou, & Rizza, 2010; Andoh, 2012). In a study conducted by Ananiadou, & Rizza, (2010) it was found that many teachers who did not consider themselves to be well skilled in ICT usage felt anxious about using it in front of a class of students who perhaps knew more than they did. This current gap in teachers’ knowledge, understanding and awareness of ICT remains a cause for concern.

Teacher anxiety over being replaced by ICT or losing their authority in classroom as learning process adapts ICT could be alleviated only if teachers had a keen understanding and appreciation of their changing role. Teachers, who receive appropriate professional development through right in-service, learn how to manage their classroom and use ICT to create a more stimulating and interesting learning environment while realizing that their pedagogic knowledge rather than technical knowledge is what makes them teachers. A survey by Teo, (2008) revealed that lack of effectiveness in using ICT to support teaching and learning in secondary school, was as a result of lack of guidance on using those technologies, despite the beneficial role that such technologies could play in supporting teaching and learning.
6. Conclusion

The emergence of technologies has complicated the way teachers teach and the way they implement it into teaching. The successful implementation of technology into teaching and learning is more complicated than installing infrastructures into classrooms and being connected to internet. The implementation of the technology requires teachers to have time to adequately prepare to use it, to learn how to use and understand it. In this respect, teachers need to be lifelong learners; they should have skills, knowledge and positive attitudes towards adoption and integration of ICT into teaching.

The government of Kenya recognizes implementation of ICT in secondary schools will contribute to knowledge production, information and communication sharing among the school community. ICT has a direct role to play in schools and if used properly, it can bring many benefits to school as well as to the community. ICT will present new opportunities for teaching and learning by providing opportunities for teacher-to-learners, teacher-to-teacher and learner-to-learner communication and cooperation, enhanced opportunities for several technologies delivered by teachers, creating superior keenness for learning among students and presenting access to a wider variety of courses. However, access and availability of ICT in public schools is still patchy. This has been attributed to several hindrances that have lead to its underutilization. For successful implementation of the technology into teaching, the article has highlighted on personal characteristics that positively or negatively influences teachers’ adoption and integration of ICT into teaching.

A review of previous research studies and reports on implementation of ICT in schools show that there are personal characteristics that influence teachers’ adoption and integration of the technology into teaching. Gender, age, level of education, teaching experience, teacher workload, attitudes towards computer and ICT competence has been identified as factors influencing teachers’ adoption and integration of the technology into teaching. These factors are interrelated. The successful implementation of ICT is not dependent on the absence or availability of personal characteristics, but is determined through dynamics process involving a set of interrelated factors. Identifying and knowing the extent to which these characteristics affect teachers’ during implementation of ICT may help in taking a decision on how to tackle them.
Teachers’ might have negative attitude towards adoption and integration of ICT into teaching because of low level of confidence in their abilities and tendency to consider themselves not qualified to teach with it. Teachers’ attitude, interest and motivation towards ICT could be increased by training on how to integrate ICT within their learning area and availing ICT infrastructure for their use while teaching. A more promising way forward should be a sustained professional development plan that draws on teachers local professional communities, encourages constant peer learning by teachers of similar subjects and age groups and supports reflective classroom performance. Teachers themselves need to become constant learners, with traditional teacher training models perhaps being replaced by models that allow teachers to learn independently, at their own rate and supported by ICT. Essential maintenance tools should be tools for self-assessment that direct teachers to appropriate knowledge sources.

7. References


Andoh, B. (2012) An exploration of Teachers’ skills, perceptions and practices of ICT in teaching and learning in the Ghanaian second-cycle schools, Contemporary education technology 3(1) 36-49


Papioiannon, P & Charalambous, K (2011) Principals’ attitudes towards ICT and their perceptions about the factors that facilitate or inhibit ICT integration in primary schools of Cyprus, *journal of Information Technology Education* 10(1) 349-369
